

Optical LAN delivers flexibility and financial savings to support digital learning within Santa Fe public schools

Tellabs[™] Optical LAN Solutions allows teachers to configure classrooms while also enabling the school system to reduce costs and position itself to satisfy future requirements.



Customer's goals — select a communications infrastructure that:

- is flexible, allowing teachers to configure classrooms to suit educational activities, with no limitations imposed by that infrastructure;
- is financially and environmentally sustainable, minimizing initial technology investment and reducing energy consumption and ongoing maintenance costs for both buildings and technology
- has a small footprint and thus conserves physical space
- centralizes and simplifies the management of LAN connectivity

Tellabs solution — Optical LAN with Gigabit Passive Optical Network (GPON) technology

- Tellabs[™] 1134 Optical Line Terminal (OLT)
- Tellabs[™] 120W Mini, 709GP and 728GP Optical Network Terminals (ONTs)

Business results – Tellabs Optical LAN solution:

- saved —depending on the size of the school and the building's age — about 11% in upfront costs compared to those incurred with a traditional copper-based active Ethernet LAN
- converged multiple services onto a single fiber
- reduced energy costs by up to 30%-65% compared to copper-based LAN — in one school alone, the annual savings in energy costs exceeded the cost of a teacher's average salary
- freed up physical space for more classrooms, thanks to minimal or no need for telecommunications closets

The Santa Fe Public School (SFPS) district, with 2,100-plus employees, encompasses more than 1,000 square miles in Santa Fe and surrounding communities in northern New Mexico. About 14,000 students, pre-K through 12th grade, attend classes throughout 39 schools. To enable teachers and students to take full advantage of digital learning technologies, SFPS administrators are changing out the district's copperbased active Ethernet LAN for a Tellabs Optical LAN solution based on Gigabit Passive Optical Network (GPON) technology.

The educational and financial benefits are evident from the start

Elias Bernardino, executive director of the SFPS Technology Department, says that when Tellabs partner IT Connect, Inc., an integrator serving the New Mexico area with comprehensive installation and project management services, demonstrated the capabilities of the Optical LAN, he immediately recognized that the infrastructure's multiple benefits would ripple throughout the school system.

"With the Optical LAN solution, our customers the teachers — could configure their classrooms according to their needs, rather than being restricted by the location of the ports on a copper-based LAN."

"The first thing I saw was the flexibility for a teacher to move within the four walls of the classroom," he says. "With the Optical LAN solution, our customers — the teachers — could configure their classrooms according to their needs, rather than being restricted by the location of the ports on a copperbased LAN."

Such flexibility would extend to students as well, giving them high-speed, high-performance access to digital learning tools, including Wi-Fi and cloud-based networking, via their desktop computers, laptops and smartphones. In addition, Bernardino's financial analysis showed that the Optical LAN solution would reduce the school district's upfront and ongoing communications costs. For example, in the El Camino Real school, one of the locations where the district already has installed the Optical LAN solution, the original design called for a total of 963 live ports. However, educational activities in the school ultimately required 1,078 live ports.

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Further, because the Optical LAN solution requires few, if any, communications closets, the district no longer would have to pay to maintain and refresh active Ethernet equipment installed in the copper-based LAN closets.

"Last but not least," Bernardino says, "the Tellabs Panorama PON Manager easy-to-use graphical user interface (GUI) means I don't have to have a Tier 3 or Tier 2 engineer come into my shop and configure a port. We are training my Help Desk staff on how to do that. So the Tellabs Optical LAN solution allows me to leverage existing resources and save the district even more money."

Simplify the network, save money and speed up service delivery

Compared to a copper-based LAN, an Optical LAN solution is a simpler, more streamlined and more cost-effective network. It collapses the traditional LAN architecture and converges voice, data and video services onto a single optical fiber. An Optical LAN solution also requires less equipment and cabling than a copper-based LAN, so it saves even more money. Plus, because it centralizes all management functions for the entire network in one location, the Tellabs Panorama PON Manager allows the IT staff members to configure and reconfigure classroom and office connectivity much faster and more easily than they could with a traditional LAN.

Frees up physical space for additional classrooms

By reducing cabling, floor, rack and communications closet requirements, an Optical LAN solution saves a great deal of



Tellabs Optical LAN solution can serve as many as 8,000 users.

physical space. For example, a typical copper-based LAN serving up to 2,000 users requires 90 rack units of space. The active Ethernet LAN switches take up one full rack, while two additional racks are necessary to terminate the large bundles of copper cables associated with the switches — for a total of 18 seven-foot-tall equipment racks.

However, Tellabs Optical LAN solution can serve as many as 8,000 users, and because its optical line terminal (OLT) is 90% denser than active Ethernet switches, an Optical LAN solution requires only one equipment rack and only 11 rack units within the equipment rack. Further, an Optical LAN solution not only needs less physical space but also requires fewer power, fire suppression and HVAC requirements, which helps reduce overhead costs. The PON splitters, rather than going into a communications closet, reside in a fiber distribution hub (FDH) mounted on the wall, thus reducing the required floor space even more.

Bernardino says that upgrading the copper-based LAN serving the El Camino Real school would have required seven communications closets. Yet the Tellabs Optical LAN solution did not require any communications closets at all, "so that square footage allocated for seven closets could be used for another classroom," he says.

As the phased deployment of the Tellabs Optical LAN solution continues throughout Santa Fe schools, Bernardino expects the savings in physical space to ripple throughout the district, thus freeing up space for more classrooms.

"Right now, we are in the process of renovating another school in which teachers and students need two [additional] classrooms. We were able to eliminate some of the space that would have gone to a communications closet and build out a classroom with that," he says. "We realized the cost savings in square footage at that moment."

Reduce the Total Cost of Ownership Over a 10-Year Period

Bernardino's analysis revealed that the district's total cost of ownership (TCO) for an upgraded version of the previous copper LAN *at one school alone* would have been almost \$2.1 million over a decade. "By comparison," he says, "the 10-year TCO for that same school's Optical LAN will total \$433,000, nearly 80% lower than the copper LAN's TCO."

"Both TCOs encompass the initial investment plus the money required to maintain the systems, as they are today, over 10 years," he explains.

With the upgraded copper-based LAN at that particular school, he and his team also would have had to refresh those switches and systems twice over 10 years and, Bernardino says, "the maintenance cost on those switches is 'astronomical.'"

"Tellabs Optical LAN solution produces fewer thermals than copper-based active Ethernet LAN does; it can reduce the school district's energy costs by as much as 30%-65%."

He adds that he does foresee some required upgrades for the Optical LAN's hardware component, namely, having to replace the ONTs at least once in the next 10 years. "Hardware does wear out," he says, "and the school will continue to need some type of Layer 3 switch. If we were to do an entire refresh at that school, get rid of the old and put in the new, our cost would be \$433,000."

Optical LAN makes SFPS a money-saving "green" district

Because Tellabs Optical LAN solution produces fewer thermals than copper-based active Ethernet LAN does, it can reduce the school district's energy costs by as much as 30%-65%. In addition, the Optical LAN's passive architecture requires no power within the optical distribution network, and it needs less equipment than copper-based LAN, thereby reducing the amount of equipment required by other power-related areas, such as distribution and switching, conversion, backup, fire suppression and cooling.

Optical LAN components

Within the school district, the primary components of the Optical LAN solution are the Tellabs[™] 1134 Optical Line Terminal (OLT) and Tellabs[™] 120W Mini, Tellabs[™] 709GP and Tellabs[™] 728GP Optical Network Terminals (ONTs). Anchoring the SFPS Optical LAN solution is the Tellabs[™] 1134 OLT, which supports 512 ONTs and concurrently provides 2,048 Ethernet ports and up to 1,024 analog POTS lines. Connected to fiber that runs down the building risers, the 1134 OLT delivers a 2.4-Gbps connection to the Tellabs ONTs located throughout the school district's buildings. The 1134 OLT also aggregates all user traffic and feeds it, via a 1 Gbps Ethernet connection, to the transport network router.

Bernardino says that he and his team are considering whether to lease dark fiber, a strategy that eventually would allow them to deploy a single OLT at a main site and then use the leased fiber to link multiple schools, rather than having to deploy an OLT at each school. By minimizing the number of points of failure on the network, this strategy also would enhance overall network reliability. In the rural areas of the district, where dark fiber is not available, the team will have to deploy a Tellabs 1134 OLT in each school.

The SFPS district is installing a mixture of 2-port, 4-port and 24-port ONTs to deliver connectivity to classrooms, offices and building systems. Bernardino says that the network "as a whole" determines which type of ONT goes into a particular location.

"Historically, the collaboration between technology and [network] construction has led us to a fight for ceiling space," he says, "meaning, how much conduit do we need for our network? Today, we no longer have to fight for ceiling space. For example, with the traditional LAN, we would have needed 120 copper lines to support 120 drops, but the Optical LAN solution allows us to support all those drops with only eight fiber lines."



Tellabs designed the 2-port IP/Ethernet 120W Mini ONT to be installed inside walls rather than on desktops, so there is no cabling clutter in the classrooms.

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"We normally use a 4-port ONT in a central location, and from there on out we use copper to connect to an HVAC unit or to security cameras, if needed. We use a 24-port ONT in our labs to minimize the use of copper [from the ONT to the device or system]. We use the 2-port ONTs inside the classroom, where teachers connect a computer, a printer or whatever device they need to connect through Ethernet," Bernardino explains. "It all comes back to the design of the network itself."

Tellabs designed the 2-port IP/Ethernet 120W Mini ONT to be installed inside walls rather than on desktops, so there is no cabling clutter in the classrooms. Providing the same wall-outlet connectivity with which active Ethernet users are familiar, the 120W Mini ONT offers GPON connectivity, including Power over Ethernet (PoE), and integrates high-speed data, voice and video within a single fiber. By simplifying and streamlining installation procedures, the 120W Mini ONT helps reduce both CapEx and OpEx costs and, compared to active Ethernet and fiber-to-the-desktop (FTTD) architectures, it reduces Optical LAN deployment costs even further.

The 4-port Tellabs[™] 709GP ONT, designed for desktop installation, provides IP/Ethernet with PoE+ connectivity, as does the 24-port rack-mounted Tellabs[™] 729GP ONT, which also supports analog telephone connectivity.

Flexible support for a broad range of services

Within the SFPS district, the Tellabs Optical LAN solution supports practically every communications service that teachers, students and administrators require. "Everything," Bernardino says, "resides on the system at each school: voice communications (all VoIP phones); data; videoconferencing; Wi-FI wireless communications; HVAC units; security cameras and access control for doors; water meters; and solar array systems."

Phasing in the Optical LAN

Bernardino and his team are phasing in the Optical LAN solution across the district, in part to spread out the cost over time. He adds that they also "have to make sure that we design the Optical LAN appropriately for each school. That takes time because they're all different." In addition, a phased deployment ensures that construction does not disrupt classes. Consequently, all of the work takes place after hours, on weekends and during the summer.

As of early 2015, seven sites are up and running on the Tellabs Optical LAN solution and, assuming that no funding issues crop up, Bernardino says that he expects to complete the Optical LAN deployment across the entire district, including administration offices, within the next three to four years.

"Compared to copper-based active Ethernet LANs, an Optical LAN solution offers practically limitless bandwidth while using up to 90% less space and consuming up to 30%-65% less power."

For Santa Fe educators, Optical LAN is the "I3" solution Bernardino says that one of the biggest challenges facing the U.S. education system is the fact that the three- to five-year strategic planning approach typical of most school districts does not align with their typical one-year funding formula. To avoid that conflict, he says that it's necessary to adopt a "I3 philosophy," or "invest in information and innovation." In other words, by implementing sustainable systems, educators can give themselves the flexibility to create sustainable finance strategies.

Tellabs specifically designed its Optical LAN solution to be scalable and both environmentally and financially sustainable. Compared to copper-based active Ethernet LANs, an Optical LAN solution offers practically limitless bandwidth while using up to 90% less space and consuming up to 30%-65% less power. It also incurs Day-1 capital costs that are 30%-50% lower than traditional LAN solutions and saves 50%-70% in year-over-year costs, for a significantly lower total cost of ownership.

"The Tellabs Optical LAN solution allows SFPS not only to be sustainable but also cost-effective," Bernardino says. "It allows us to reduce our costs and then apply those savings to investments in other areas of education."

Take the next step. Contact Tellabs today.



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